

SOME UNUSUAL SHAPES AND  
FEATURES OF AUSTRALITES (TEKTITES).

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Plates VI-XIV.

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Some rare types of australites, differing from the common forms in shapes and surface structures are recorded in this paper. Twenty-nine were selected from 880 specimens collected by myself and friends near the Sherbrook River, a few miles east of Port Campbell (Baker, 1937), and two from a collection of Western Australian specimens in the Geological Department, Melbourne University.

Their weights, specific gravities and dimensions are set out in Table I (see page 51). In the diameter column, figures not bracketed refer to external diameters of flanges, bracketed figures to internal diameters.

PLATE VI

- Fig. 1. An oval, traylike form without a central core; the lightest complete and unweathered australite on record. The flat anterior surface curves at the edges, and the posterior surface is slightly concave; both surfaces have strongly marked, contorted flow lines, and a bubble cavity, 1 mm. across, forms a small hole through the specimen. Locality: Six miles east of Port Campbell.
- Fig. 2. An oval, platelike australite with flat posterior surface, slightly concave anterior surface, and small core  $2 \times 3$  mm., surrounded by minute, elliptical bubble pits. The few flow lines are confined to the posterior surface. Locality: Three and a quarter miles east of Port Campbell.
- Figs. 3A and 3B. Side and posterior aspects of a bowl-shaped form (Baker, 1940) with a smooth rounded lip, a small core with flow lines at the base of the bowl, and numerous minute bubble pits on both surfaces; the walls of the bowl slope uniformly down to the core, which is not visible in the photograph. Locality: One and a half miles east of track to Loeh Ard Gorge.

PLATE VII

- Fig. 4. An elongated form, canoe-shaped in side aspect. The flange, which is developed on one side (left-hand side in fig. 4) and partly along one end, arises at an angle of  $80^\circ$  from the core; it is thin and its

anterior surface is flow-ridged. A highly contorted flow-line pattern occurs on the posterior surface of the core, a concentric flow-line pattern on the flange. The shape does not appear to be due to fracturing. Fenner (1940, p. 316) described a somewhat comparable form with a flange on one side only as resembling a Cornish pasty. Locality: East of Deany Steps,  $1\frac{1}{4}$  miles east of Port Campbell.

Fig. 5. An irregular oval, with a flat, bubble-pitted posterior surface on which is a curious fleur-de-lys-shaped depression, less bubble-pitted and more flow-lined than the rest of the posterior surface; this depression has probably resulted from the bursting of coalesced, larger bubbles. The anterior surface is smooth and flow-ridged. Locality: Half a mile east of Sherbrook River.

Figs. 6A and 6B. Side and posterior surfaces of a form with strongly marked flow lines trending towards a small flange at the right-hand end of the posterior surface. Bubble pits elongated parallel to the flow lines; flange thin. Anterior surface (bottom of fig. 6A) carries circular bubble pits, crinkly and irregular flow ridges, and occasional flow lines simulating symmetrical compression folds. Locality: Near Gravel Point, 3 miles east of Port Campbell.

#### PLATE VIII

Figs. 7A and 7B. Anterior surface and end-on aspect of a curious form which appears to have been squeezed at one end. The ragged outline of the top end (fig. 7A) results from erosion of the thin edge. Outstanding features are a fingernail-like impression on the posterior surface and opposite this, on the anterior surface, a constricted, elevated, flange-like structure (bottom of fig. 7A). Most flow ridges and flow lines on the anterior surface are parallel to edges. Locality: Broken Head, 4 miles east of Port Campbell.

Fig. 8. Posterior surface of an elongated, very thin, traylike form with prominent, elongated bubble marks coalescing on the posterior surface; there is no defined core or flange. Occasional small bubble pits and flow lines on anterior and posterior surfaces; the flow lines frequently conform to the shapes of the larger bubble cavities, but some trend across them. The base of one bubble cavity has worn away, leaving a hole through the specimen. Locality: South side of Great Ocean Road,  $3\frac{1}{2}$  miles east of Port Campbell.

#### PLATE IX

Figs. 9A and 9B. Posterior and side aspects of a pear-shaped form. Molten glass from the anterior surface has flowed over part of the bubble-pitted equatorial portions of the posterior surface; the prominent groove in it was probably formed by escaping gas. A small flange subsequently developed along the tapering sides of the australite. On the anterior surface (fig. 9B) wrinkled flow ridges are prominent, and on the posterior surface, bubble pits elongated parallel to the long axis pass into shallow flow grooves at the tapered end. Locality: West of Port Campbell.

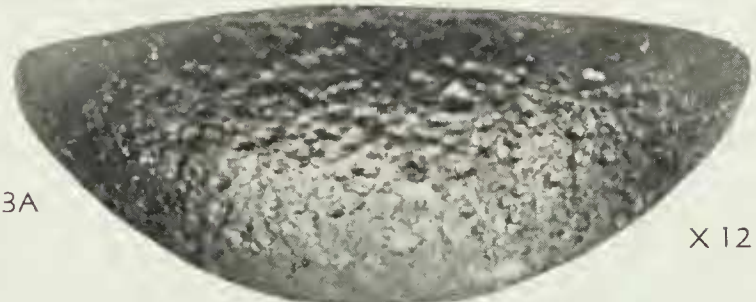
Figs. 10A and 10B. Posterior surface and side aspect of a ladlelike form from which part of the narrow end has broken away. On the posterior



X 10.4



X 65



X 12



X 12



4



X 7.5

5



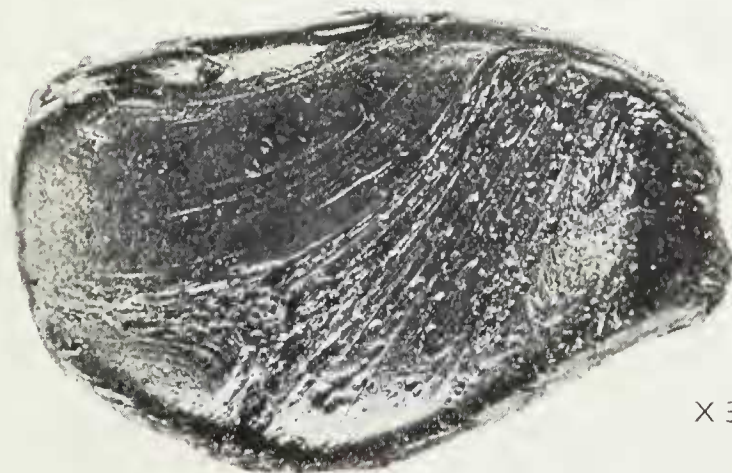
X 5.5

6A



X 3.2

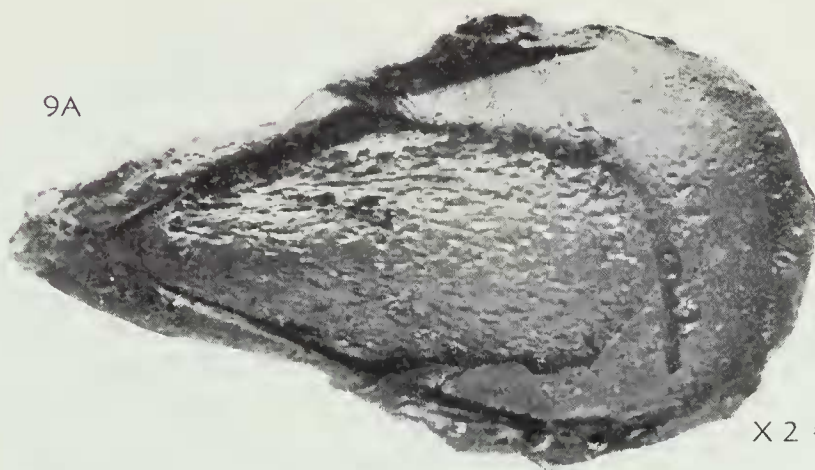
6B



X 3.2



9A



X 24

9B



X 24

10A



X 7

10B



X 7





11A

X 4



11B

X 4



12A

X 6.5



12B

X 6.5



13



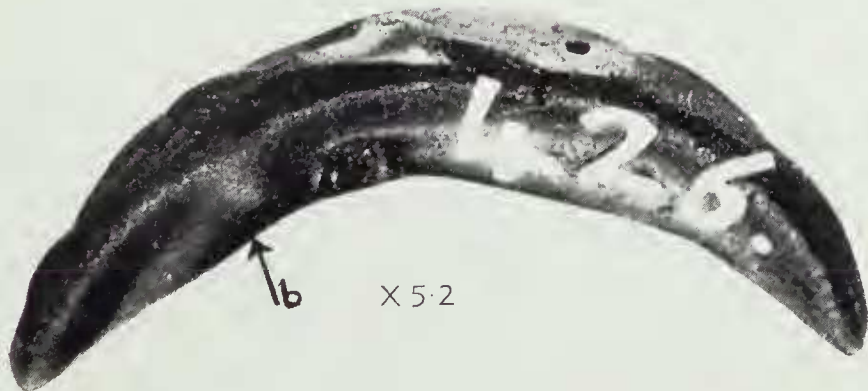
X 3

14



X 44

15



X 5.2



16



17



18



19



20



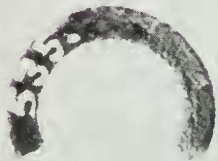
21



22



23



24



25



26



27



28



29



15



30

All X 1.5



31A

X 3.5



31B

NAT. SIZE



surface, bubble pits are elongated and drawn out at the narrow end into flow grooves (fig. 10A). The anterior surface has one prominent flow ridge (fig. 10B), and numerous flow lines simulating an isoclinal fold, some of which terminate sharply against the flow ridge on one side but pass through it on the opposite side. Locality: A quarter of a mile north-east of Port Campbell Sports Ground.

## PLATE X

Figs. 11A and 11B. A pear-shaped form comparable with Fenner's (1934) "air bombs." A few large bubble pits and flow lines occur on the posterior surface (top of fig. 11A) and a lesser number on the anterior surface (fig. 11B). At the narrow end are occasional flow grooves. Flaked areas on the anterior surface (fig. 11B) suggest some plucking away of glass during flight. Locality: Near Baker's Oven Rock,  $3\frac{1}{4}$  miles east of Port Campbell.

## PLATE XI

Figs. 12A and 12B. A cusp-shaped form (fig. 12A) teardrop-like when viewed from above (fig. 12B). On the anterior surface are flow ridges at right angles to the long axis (top of fig. 12A) which become crinkled towards the narrow end. Few bubble pits; deep bubble crater on posterior surface (dark area at top of fig. 12B). On the posterior surface are flow lines, small flow ridges (normally typical of anterior surfaces) and short, reticulating flow grooves; the flow lines trend towards the two drawn-out portions (fig. 12A). The edges are turned slightly back towards the posterior surface, indicating an early stage in flange formation. Locality: Near Twelve Apostle rock stacks, 6 miles east of Port Campbell.

## PLATE XII

Fig. 13. A club-shaped australite with a somewhat polished surface, a few flow lines and small bubble pits; occasional wrinkled flow ridges on the head of the club. Length of shaft 24 mm.; thickness 7 to 8 mm.; width of the head 11 to 15 mm. at the widest end. The top portion, carrying remnants of flow ridges, is part of the original anterior surface. Locality: Near Kurnalpi, north-east Coolgardie Goldfield, Western Australia.

Fig. 14. Another club-shaped australite; surface dull and carrying numerous small marks like percussion figures. Flow lines and flow grooves are conspicuous on the sides of the head near the shaft, but there are very few bubble pits. Shaft 10 mm. long and from 4 to 5 mm. thick; the head is 7 mm. thick and 11 mm. wide. Locality: Kalgoorlie district, Western Australia.

The shape of these two club-like forms has been determined by abrasion, and the shape of the head of the Kurnalpi specimen has been partly determined by deep flow grooves. The position, shape and length of the shaft of the Kalgoorlie specimen has been determined by flow grooves and flow lines parallel to and adjoining the outer

edges. It appears to have been originally boat-shaped and to have been reduced to its present shape by selective flaking and abrasion.

Fig. 15. (Plates XII and XIII.) A fragment, approximately one third of a flange; on the posterior surface is a gas blister,  $1\frac{1}{2}$  mm. across, marked *b* in fig. 15, Plate XII, an unusual feature on flanges. The thin glass film covering this bubble has been distended by the enclosed gas. No similar bubbles have been noted in other flanges examined, although larger bubbles are not uncommon in cores. Most bubbles in flanges have burst and are represented by small pits or craters (see fig. 15, Plate XII). Locality: Near Sentinel Rock,  $1\frac{1}{2}$  miles east of Port Campbell.

#### PLATE XIII

Figs. 16 to 30. Posterior surfaces of flanges detached from the cores of button-shaped or oval (figs. 17, 28) australites by clean natural fractures.

The posterior surfaces are smooth, except for occasional small bubble craters, but fine concentric flow lines can be observed under higher magnifications. The anterior surfaces are usually flow-ridged. Few examples of such complete flanges have been recorded in the extensive literature on australites.

One fragment of a thin flat-topped flange (fig. 24), is exceptional in having both the posterior and the anterior surfaces rough.

Fig. 30 represents portion of an unusual, thin, broad type which carries eight shallow, elliptical bubble craters on its posterior surface; five form a cluster (in the bottom part of the photograph) and two others have coalesced. A remnant of the core attached to the fragment is distended by the escape of a large gas bubble, originally at least 10 mm. across. Such a form would be very prone to fragmentation. The bases of the bubble craters on the flange fragment are marked by occasional flow lines and minute bubble pits. Between the bubble pits, the glass of the flange is also flow-lined.

The outer and inner rims of flanges in Plate XIII are generally smooth, but their continuity is sometimes interrupted by small bubble craters (fig. 21). Wrinkled flow ridges at the equators of anterior surfaces occasionally cause the outer to be less symmetrical than the inner edges (figs. 28, 29). The truncated portion at the bottom of fig. 26 is caused by a fracture.

Localities: From between half and  $5\frac{1}{2}$  miles east of Port Campbell, except No. 22, which came from near Marble Arch, 3 miles west of Port Campbell.

#### PLATE XIV

Figs. 31A and 31B. A flange fragment embedded in sandstone of Recent age, overlying post Miocene clays; the cementing medium in this rock is argillaceous. The specimen came from a steep slope near the cliff edge in a small bay north of Gravel Point,  $2\frac{1}{2}$  miles east of Port Campbell. The sandstone forms a hard band a few feet thick below 4 feet of clay and surface soil.

Australites usually occur on wind-blown or rain-swept surfaces, or have been washed out of loose, incoherent deposits. The only other record of an australite in consolidated rock is a specimen from Gawler, South Australia (Tate, 1879); it was enclosed in a travertine nodule forming part of the Recent crust limestone in that area.

TABLE I  
*Measurements of Certain Australites*

| Fig. No. | Type  | Weight (gm.) | Sp. Gr. | Diameter (mm.) | Length (mm.) | Breadth (mm.) | Depth (mm.) | Width of Flange (mm.) |
|----------|---|--------------|---------|----------------|--------------|---------------|-------------|-----------------------|
| 1        | Small tray .. .. .                            | 0.0645       | 2.350   | —              | 9            | 6             | 1           | —                     |
| 2        | Flat oval plate .. .. .                       | 0.276        | 2.380   | —              | 13           | 10            | 1           | 8-10                  |
| 3        | Elongate bowl .. .. .                         | 0.135        | 2.410   | —              | 7.5          | 5             | 3           | —                     |
| 4        | Curious button .. .. .                        | 0.439        | 2.425   | —              | 11           | 7             | 5           | 2                     |
| 5        | Irregular oval .. .. .                        | 0.865        | 2.436   | —              | 12           | 10.5          | 4.5         | —                     |
| 6        | Aberrant .. .. .                              | 4.247        | 2.430   | —              | 30           | 11.16         | 4-7         | 1-2                   |
| 7        | Aberrant .. .. .                              | 1.592        | 2.408   | —              | 20           | 16            | 0.5-7       | 1-2                   |
| 8        | Elongated tray with bubble craters .. .. .    | 0.277        | 2.401   | —              | 18.5         | 8.5           | 2           | —                     |
| 9        | Pear-shaped form .. .. .                      | 16.315       | 2.426   | —              | 43           | 1-24          | 2-17        | 1.5-8.0               |
| 10       | Ladle-like form .. .. .                       | 0.520        | 2.418   | —              | 13.5         | 3-6.5         | 1-5         | 0.5                   |
| 11       | "Aerial Bomb" .. .. .                         | 18.860       | 2.425   | —              | 36           | 21            | 20          | —                     |
| 12       | Aberrant .. .. .                              | 1.554        | 2.413   | —              | 18           | 1-12          | 1-10        | —                     |
| 13       | Club-like form .. .. .                        | 5.422        | 2.451   | —              | 35           | —             | —           | —                     |
| 14       | Club-like form .. .. .                        | 2.440        | 2.440   | —              | 26           | —             | —           | —                     |
| 15       | Flange fragment .. .. .                       | 0.429        | 2.400   | —              | —            | —             | 4           | 4                     |
| 16       | Complete flange .. .. .                       | 0.750        | 2.381   | 15 (7.5)       | —            | —             | 3.5         | 3.75                  |
| 17       | Complete flange .. .. .                       | 0.749        | 2.385   | —              | 18.5         | 17            | 3           | 3                     |
| 18       | Complete flange .. .. .                       | 0.961        | 2.394   | 18 (10)        | —            | —             | 4           | 4                     |
| 19       | Complete flange .. .. .                       | 0.915        | 2.395   | 18 (11)        | —            | —             | 4           | 3.5                   |
| 20       | Complete flange .. .. .                       | 0.730        | 2.409   | 15 (7)         | —            | —             | 3           | 3.5                   |
| 21       | Complete flange .. .. .                       | 0.591        | 2.400   | 14 (8)         | —            | —             | 3           | 3                     |
| 22       | Complete flange .. .. .                       | 0.649        | 2.380   | 14 (8)         | —            | —             | 3-4         | 3                     |
| 23       | Complete flange .. .. .                       | 0.731        | 2.405   | 16 (9)         | —            | —             | 3           | 3.5                   |
| 24       | Flange fragment .. .. .                       | 0.272        | 2.410   | 17 (11.5)      | —            | —             | 1.5-2       | 2.5-3.0               |
| 25       | Flange fragment .. .. .                       | 1.005        | 2.421   | 20.5 (12.5)    | —            | —             | 3           | 3.5-4.0               |
| 26       | Complete flange .. .. .                       | 0.750        | 2.381   | 15 (7.5)       | —            | —             | 3.5         | 3.75                  |
| 27       | Complete flange .. .. .                       | 0.731        | 2.404   | 15 (8)         | —            | —             | 3.5         | 4                     |
| 28       | Flange fragment .. .. .                       | 0.874        | 2.369   | —              | 24 (16)      | 20 (12)       | 4           | 4.0-4.5               |
| 29       | Flange fragment .. .. .                       | 0.992        | 2.378   | 23 (15)        | —            | —             | 3-4         | 4                     |
| 30       | Flange fragment .. .. .                       | 0.446        | 2.335   | —              | —            | —             | 1-3.5       | 4-5                   |
| 31       | Flange fragment embedded in sandstone .. .. . | —            | —       | —              | —            | —             | 3.5         | —                     |

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